

CLAIMS:

1. A network relay apparatus for connecting networks to each other, which are logically constructed, comprising:
 - a reception port;
 - a transmission port; and
 - relay means for relaying a multicast packet between logically constructed networks based upon reception information containing reception port information related to a port which receives the multicast packet, and reception source network information related to a first network functioning as a reception source of said multicast packet; and also transmission information provided in correspondence with said reception information and containing transmission port information related to a port through which said multicast packet is transmitted, and transmission source network information related to a second network functioning as a transmission destination of said multicast packet.
2. A network relay apparatus as claimed in claim 1 wherein:
 - said reception information contains life information of a received multicast packet; and
 - one of first life information and second information is registered into said life information, as a result of a comparison made between said first life information which has already been registered in

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said life information and said second life information owned by a newly received multicast packet.

3. A network relay apparatus as claimed in claim 2 wherein:

in a case that said life information is said second life information, said reception port information and said reception source network information are updated/registered into reception port information and reception source network information of a multicast packet containing said second life information, respectively.

4. A network relay apparatus as claimed in claim 3 wherein:

said reception information includes:
valid/invalid registering information which is registered as valid information after said updating/registering operation has been carried out and thereafter a predetermined time duration has passed.

5. A network relay apparatus as claimed in claim 3 wherein:

said reception information includes:
valid/invalid registering information which becomes valid after a predetermined time duration has passed since a multicast packet had been first received.

6. A network relay apparatus as claimed in claim 1 wherein:

said registering means additionally registers information related to a multicast packet into said

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transmission information when the multicast packet is received.

7. A network relay apparatus as claimed in claim 1 wherein:

said transmission information includes:

rewrite information which is provided with a multicast packet and is rewritten when the multicast packet is relayed.

8. A network relay apparatus as claimed in claim 7 wherein:

said rewrite information includes:

comparison information acquired by comparing life information obtained after rewriting operation with life information obtained before rewriting operation while said multicast packet is relayed; and

a second layer address which is applied to a second layer of an OSI (Open systems Interconnection) reference model obtained after rewriting operation while said multicast packet is relayed.

9. A network relay apparatus as claimed in claim 1 wherein:

said network relay apparatus is further comprised of:

a learning process unit for forming both said reception information and said transmission information while the multicast packet is relayed.

10. A network relay apparatus as claimed in claim 1 wherein:

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said reception information includes:

a destination address and a transmission source address, which are related to such a multicast packet which has been registered as said reception information; and

packet discrimination information capable of discriminating as to whether or not said multicast packet registered as said reception information has already been registered into said reception information.

11. A network relay apparatus as claimed in claim 10 wherein:

said packet discrimination information includes:

reception source network information related to a network of a reception source concerning the multicast packet which is registered into said reception information; and

reception port information related to a multicast packet received port.

12. A relay apparatus comprising:

a reception processing unit for performing a multicast packet allocating operation in response to a sort of a multicast packet;

a relay processing unit for performing a relay processing operation capable of transmitting the multicast packet allocated by said reception processing unit to a transmission destination; and

a learning process unit for performing such

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an operation that while said relay processing operation by said relay processing unit is carried out, information related to said transmitted multicast packet is registered into a predetermined table.

13. A relay apparatus for constituting a VLAN (Virtual Local Area Network), comprising:

a VLAN table including:

a discrimination number for a VLAN to which another relay apparatus connected to an own relay apparatus belongs;

port information related to a port connected to said another relay apparatus, which is provided in correspondence with said discrimination number; and

valid port information provided in correspondence with said port information, capable of discriminating as to whether or not said another relay apparatus owns a learning function by which information related to a multicast packet is registered into a predetermined table similar to an own relay apparatus; and in which when said another relay apparatus owns said learning function, said port is regarded as a valid port and is registered.

14. A relay apparatus as claimed in claim 13 wherein:

said valid port information is registered as a valid port, since the own relay apparatus transmits/receives a signal to/from said another relay apparatus.

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15. A relay apparatus as claimed in claim 14 wherein:

said signal corresponds to such a packet exclusively used in said relay apparatus.

16. A relay apparatus as claimed in claim 15 wherein:

said signal corresponds to such a signal produced by adding specific information to a header of a packet.

17. An information relay apparatus for relaying information in a plurality of logical information networks, comprising:

a multicast relay destination registering table into which a relay destination in a predetermined multicast relay process operation is registered; and

multicast relay means operated in such a manner that when data is relayed from networks which are physically identical to each other, but are logically different from each other to a same destination with reference to said multicast relay destination registering table, such data having a same content are relayed only one time to said same destination with respect to a relay destination.

18. An information relay apparatus for relaying information in a plurality of logical information networks, comprising:

a reception port;

a transmission port; and

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multicast relay means for receiving only one time, one of multicast packets having a same content and directed to a same destination from information networks which are physically identical to each other, but are logically different from each other after a first multicast packet has been received from said information networks, and thereafter, a preselected time duration has passed.

19. An information relay apparatus for relaying information in a plurality of logical information networks, comprising:

- a reception port;
- a transmission port; and

multicast relay means for transmitting one time, one of multicast packets having a same content to relay a destination which constitutes such networks physically identical to each other, but logically different from each other in a case that multicast packets having the same content and directed to the same destination are transmitted after a first multicast packet has been received from said information networks, and thereafter, a preselected time duration has passed.

20. An information relay apparatus as claimed in claim 17 wherein:

said networks which are physically identical to each other, but are logically different from each other include:

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a logical network which is exclusively provided in order to execute a multicast relay process operation.

21. An information relay apparatus as claimed in claim 17 wherein:

in such a case that a multicast packet is received from more than one network which are physically identical to each other, but are logically different from each other, one network selected from more than one network which are physically identical to each other, but are logically different from each other is registered as a representative network in said multicast relay destination registering table.

22. An information relay apparatus as claimed in claim 21 wherein:

when said multicast relay means receives a multicast packet from said network registered as the representative network, said multicast relay means relays said received multicast packet with respect to transmission destinations which are registered in said multicast relay destination registering table.

23. An information relay apparatus as claimed in claim 21 wherein:

a difference between life information about a multicast packet when being received from said network registered as representative network, and life information about said multicast packet when the multicast packet received by the multicast relay

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process operation is transmitted is registered as rewrite information in said multicast relay destination registering table.

24. An information relay apparatus as claimed in claim 23 wherein:

among said more than one network which are physically identical to each other, but are logically different from each other, and also which receive the same, or duplicated multicast packets, such a reception network which has received the multicast packet whose life information value is large is registered as a representative network in said multicast relay destination registering table.

25. An information relay apparatus as claimed in claim 23 wherein:

said multicast relay means rewrites a multicast packet received from said network registered as the representative network based upon said rewrite information, and thereafter relays the rewritten multicast packet.

26. An information relay apparatus as claimed in claim 25 wherein:

with respect to the relay process operation of an IPv4 (Internet Protocol version 4) multicast, said life information corresponds to a TTL value of an IPv4 header of a multicast packet.

27. An information relay apparatus as claimed in claim 25 wherein:

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with respect to the relay process operation of an IPv6 (Internet Protocol version 6) multicast, said life information corresponds to a Hop Limit value of an IPv6 header of a multicast packet.

28. An information relay apparatus for constituting a logical network, comprising:

a multicast relay destination registering table into which when a multicast packet is received from more than one network which are physically identical to each other, but are logically different from each other, one network among said networks physically identical to each other, but logically different from each other is registered as a representative network.

29. An information relay apparatus for constituting logical networks and for relaying a multicast packet received from a first logical network to a second logical network, comprising:

a reception port;
a transmission port; and

relay means operated in such a manner that said multicast packet transmitted from said first logical network is received via one port from another information relay apparatus which similarly constitutes logical networks, and said multicast packet is transmitted via the other port to another logical network containing either said first logical network or said second logical network.

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30. An information relay apparatus for relaying a multicast packet among logically formed networks, wherein:

in such a case that similar to an own information relay apparatus, another information relay apparatus connected to the own information relay apparatus owns a learning function related to a relay process operation of a multicast packet,

both said own information relay apparatus and said another information relay apparatus constitute a logical network which is exclusively employed so as to perform the multicast relay process operation.

31. An information relay apparatus for relaying a multicast packet received from a first logical network to a second logical network, comprising:

relay means for relaying said multicast packet received from said first logical network only one time after a first multicast packet has been received from either said first logical network or said second logical network, and thereafter, a predetermined time duration has passed, whereby said multicast packet is relayed to information relay apparatuses which constitute said second logical network.

32. An information relay apparatus comprising:

a reception port;
a transmission port; and

transmission means operated in such a manner that after a first multicast packet has been received

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from a network which is connected to an own information relay apparatus and is logically constituted, and thereafter, a predetermined time duration has passed, a multicast packet received from said network is transmitted only one time to another network which is logically constituted.

33. An information relay apparatus as claimed in claim 32 wherein:

said multicast packet which is transmitted by said transmission means only one time owns a same destination as that of a multicast packet which is received from said network within said predetermined time duration, and owns a same transmission source so that of said second-mentioned multicast packet, and further, is received from a same port for said second-mentioned multicast packet.

34. A relay apparatus for connecting networks to each other, which are logically constructed, comprising:

a learning table into which transmission destination information of transmission destinations are registered, while a multicast packet is relayed, an own relay apparatus being required to transmit the multicast packet to said transmission destinations; and

a learning process unit for relaying said multicast packet to the transmission destinations registered in said learning table by comparing both a destination address and a transmission source address

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of a multicast packet received from one network among said networks with said learned transmission destination information which is registered in said learning table.

35. A relay apparatus for connecting networks to each other, which are logically constructed, comprising:

a learning table into which information used to relay a multicast packet is registered; and

a learning process unit for relaying said multicast packet to ports contained in the learned information registered in said learning table by comparing both a destination address and a transmission source address of a multicast packet received from one network among said networks with said learned information which is registered in said learning table.

36. An apparatus comprising:

a port; and

a multicast information table including:

a reception information area into which both destination information and transmission source information contained in a multicast packet received from a first logically-constituted network are registered in correspondence with network information related to said first network; and

a transmission information area into which a second logically-constituted network is registered in correspondence with a port connected to said second

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network, a multicast packet being transmitted to said logically-constituted second network.

37. A packet relay system comprising:

a logical network which is logically arranged; and

an information relay apparatus for relaying only one time, multicast packets having a same content and received from said logical network to another logical network after said information relay apparatus has been connected to said logical network to receive a first multicast packet, and thereafter, a predetermined time duration has passed, whereby a multicast communication is carried out.

38. A packet relay system as claimed in claim 37 wherein:

said multicast packet which is transmitted by said transmission means one time owns same destination as that of a multicast packet which is received from said network within said predetermined time duration, and owns a same transmission source so that of said second-mentioned multicast packet, and further, is received from a same port for said second-mentioned multicast packet.

39. A packet relay system comprising:

a plurality of terminals;

a plurality of networks arranged by logically combining said plurality of terminals; and

a relay apparatus connected among said

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plurality of networks, including:

a learning table into which transmission destination information of transmission destinations are registered, while a multicast packet is relayed, an own relay apparatus being required to transmit the multicast packet to said transmission sources; and a learning process unit for relaying said multicast packet to the transmission destinations registered in said learning table by comparing both a destination address and a transmission source address of a multicast packet received from one network among said networks with said learned transmission destination information which is registered in said learning table.

40. A packet relay system having a plurality of logically-arranged logical networks and for relaying a multicast packet between said logical networks, comprising:

an apparatus corresponding to a destination of a multicast packet; and

a relay apparatus for receiving a plurality of multicast packets having the same contents and directed to said apparatus, and for transmitting to said apparatus, a single multicast packet having a same content as contents of said plural multicast packets which are received via one logical network among said plurality of logical networks existing between said apparatus and said relay apparatus.

41. A packet relay system comprising:

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a plurality of logically-arranged logical networks; and

a relay apparatus connected to said plurality of logical networks, for transmitting a single multicast packet having a same content with respect to said plurality of logical networks, whereby said packet relay system relays the multicast packets between the logical networks.

42. A packet relay method for relaying a multicast packet between logically-arranged logical networks, wherein:

a plurality of multicast packets having a same content and a same destination; and

in a case that a plurality of logical networks are present in an apparatus corresponding to the destination of said received multicast packets, one of said received multicast packets is transmitted to said apparatus.

43. A packet relay method for relaying a multicast packet between logically-arranged logical networks, wherein:

a plurality of multicast packets having a same content and a same destination; and

in a case that a plurality of logical networks are present in an apparatus group corresponding to the destination of said received multicast packets, a preselected set of said received multicast packets are transmitted to said apparatus group.

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